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Double Brooding by American Kestrels in Idaho

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American Kestrels (*Falco sparverius*) sometimes raise two broods in a single nesting season in captivity (Porter and Wiemeyer 1970, 1972), and double brooding by wild kestrels has been recorded in Florida and Central Missouri (Howell 1932, Toland 1985). Evidence for double brooding elsewhere, however, has been mainly circumstantial (Stahlecker and Griese 1977, Black 1979, Sutton 1979), and there have been no reports of double brooding by kestrels north of 40° latitude. During a long-term study of kestrel nest box occupancy, productivity and site fidelity, we confirmed that a pair of kestrels successfully

raised two broods in southwestern Idaho (43° N, 116° W) during a single breeding season.

In 1996, we captured the same marked pair of adults at two different nest boxes, both of which had young that reached fledging age. We captured the female on an incomplete set of three eggs at the first box on 25 March and captured the male in a mist net (Steenhof et al. 1994) placed by the same box on 17 May. We banded five young from this box on 17 May. Ages of the young at banding ranged from 15–25 d, based on a comparison with a photographic aging key (Griggs and Steenhof 1993). We recaptured the female on 18 June in a box with six eggs, 800 m from the first box. We caught the same male in this box on 28 June with three eggs and three young. We banded five 22- to 26-d-old young from this box on 23 July. We assume that all 10 young fledged from the boxes because we found no dead young in or below the boxes during subsequent checks.

Both members of the pair were at least 2-yr-old in 1996, and both had nested successfully in the area in 1995. The female was first captured on 5 February 1995 on a balchatri midway between her two 1996 nesting efforts. In 1995, she raised young in the same box where she raised her second brood in 1996. The male was first captured as a breeding adult in 1995, paired with a different female at a box approximately 1.7 km from his nearest 1996 nesting attempt.

The distance between nesting efforts in Idaho (800 m) was much greater than the distances in Missouri (0–300 m, Toland 1985), possibly due to fewer available nesting sites in Idaho. Both boxes used in Idaho were mounted on boards attached to fenceposts in open agricultural and rangeland habitats. There were no nest boxes or natural cavities nearer either box. The second clutch size (6 eggs) in Idaho was bigger than any recorded in Missouri, and in contrast to Toland's (1985) findings, the second clutch in Idaho was larger than the first clutch (5 eggs).

The estimated hatching dates of young produced by the pair that raised two broods in 1996 were 24 April and 28 June. During our 11-yr study, estimated hatch dates have been as early as 17 April and as late as 24 July ($\bar{x}$ = 25 May, SD = 18.5 d, N = 247). We have identified five broods with earlier hatch dates than the first brood of the pair that raised two broods and 10 broods with later hatch dates than their second brood, for all years combined. In 1996, the first brood of the renesting pair was the second earliest nesting effort in our study area, and the second brood was the second latest. The individuals that raised two broods in 1996 probably only raised one brood each in 1995 because their 1995 nesting chronology was closer to the long-term mean. The male's 1995 brood hatched on 14 June, and the female's hatched on 11 May.

Whether a pair will attempt to raise two broods in a single season likely depends on food availability, weather conditions and nesting experience. Both food availability and prior nesting experience may have increased the likelihood of successful double brooding in 1996. Prey remains in the two nest boxes consisted mainly of voles (*Microtus* spp.), and our subjective observations indicated that voles were unusually abundant in 1996. Both members of the renesting pair in Idaho had successfully bred in the area the prior year. As in Toland's (1985) study, double brooding may be possible only for early breeders in Idaho. The climate in southwestern Idaho provides just enough time for kestrels to raise two broods. Henny and Brady (1994) found that permanent residents nest earlier than migrant kestrels in the Pacific Northwest. The female that raised two broods in our area was known to have spent at least part of one winter near her nesting territory.

Although this was the first and only documented case of double brooding during our 11-yr study, it may have occurred before. We would have missed other cases of double brooding if kestrels used natural nest sites in trees that we did not monitor for one of their nesting attempts. We also might have missed cases if we did not capture and/or mark both adults during one of their nesting efforts. In 1996, we knew the identities of 63% of the males and 93% of the females nesting in boxes; the proportions of unidentified individuals were higher during the first 7 yr of our study. The fact that kestrels used different boxes for nesting makes it difficult to confirm double brooding if the parents are not individually marked. It also raises doubts about some suspected cases of double brooding reported in the literature. The presence of a second clutch in the same box does not constitute evidence for renesting by a particular individual or pair (Sutton 1979). During our study, we knew the identity of females in five "renestings" following failures during incubation. In three cases, females whose clutches failed during incubation moved to other boxes. In two other situations, a new female nested in the same box where a different female had failed during incubation.

American Kestrels probably require a minimum of 120 d to raise two broods successfully: at least 5 d for each laying period, 27 d for each incubation period and 30 d for each brood-rearing period (Porter and Wiemeyer 1972). In southwestern Idaho, kestrels begin laying eggs as early as mid-March, and young have fledged as late as early to mid-August, a window of approximately 150 d. Theoretically, pairs with young that hatch earlier than 15 May could produce a second brood, and broods with hatch dates later than 15 June could be second broods. In our 11-yr study, 31% of broods hatched on or before 14 May, suggesting that almost one-third of the population nests early enough to produce two broods. However, only 15% of broods hatched after 15 June, indicating that at least half of the early nesters do not produce a second brood. In addition, some of the late broods represent pairs that nest late for other reasons, including renesting after failures during incubation. During our study, we knew of six renestings following failures, only two of which were successful. The young from these nesting at-

tempts hatched on 15 and 19 June, 9–13 d earlier than the second brood from the double brooding pair. If we assume conservatively that only those broods with hatch dates after 28 June (the hatch date of the second brood we confirmed) were second broods, then approximately 4% of the kestrel pairs in southwestern Idaho raise second broods. Continued monitoring of marked adults should provide more insight about the frequency of double brooding in northern latitudes.

RESUMEN.—Una pareja marcada de *Falco sparverius* crió dos nidadas de cinco en una temporada en dos cajas de nidos diferentes en el sur oeste de Idaho. Los dos padres tenían el mínimo de dos años y tenían éxito con nidos en el lugar antes. Las dos crías eran primera y la mas tarde en la área de estudio, pero sospechamos que hasta 4% de parejas en el sur oeste de Idaho crían dos crías cada temporada.

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